

Improved Traceability of a Small Satellite Mission Concept to Requirements Using Model Based System Engineering

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Model Based Systems Engineering (MBSE) has recently been gaining significant support as a means to improve the “traditional” document-based systems engineering (DBSE) approach to engineering complex systems. In the spacecraft design domain, there are many perceived and proposed benefits of an MBSE approach, but little analysis has been presented to determine the tangible benefits of such an approach (e.g. time and cost saved, increased product quality). This paper presents direct examples of how developing a small satellite system model can improve traceability of the mission concept to its requirements. A comparison of the processes and approaches for MBSE and DBSE is made using the NASA Ames Research Center SporeSat CubeSat mission as a case study. A model of the SporeSat mission is built using the Systems Modeling Language standard and No Magic’s MagicDraw modeling tool. The model incorporates mission concept and requirement information from the mission’s original DBSE design efforts. Active dependency relationships are modeled to demonstrate the completeness and consistency of the requirements to the mission concept. Anecdotal information and process-duration metrics are presented for both the MBSE and original DBSE design efforts of SporeSat.